

U.S. Patent Application Serial No. 09/745,998
Response dated February 11, 2004
Reply to OA of **December 22, 2003**

REMARKS

Claims 1-38 are pending in this application. Claims 13 and 32 have been amended herein.

An amendment to the specification has also been made. This amendment corrects a typographical error in an equation, and Applicants submit that no new matter is added by this amendment.

Claims 13-19 and 32-38 are rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office action paragraphs no. 2-3)

Reconsideration of the rejection is respectfully requested in view of the proposed amendment to claims 13 and 32, to clarify the wording of these claims.

In both the amendment to claim 13 and to claim 32, the claim is amended as follows:

“acceptor levels and/or donor levels are non-uniformly formed in the direction of confinement in the light emitting layer having said quantum well structure so that in order to decrease a potential gradient generated by the piezoelectric effect in the direction of confinement is decreased in said quantum well structure”.

As the Examiner has pointed out in paragraph no. 18 of the final Office action, for a given donor level, the energy of the donor level is determined by the crystal host and the donor species. It is impossible to form donor levels with different energies by using the same crystal host and the same donor, and thus the inventors originally have no idea of nonuniformly forming the donor level energy. What the inventors argue is to form the donor/acceptor level at the spatially nonuniform density (in a direction of confinement of the quantum well structure) by spatially nonuniform doping (in the confinement direction), which is possible. Similarly, it is also possible to form the

U.S. Patent Application Serial No. **09/745,998**
Response dated February 11, 2004
Reply to OA of **December 22, 2003**

donor/acceptor level at a spatially nonuniform density (in the confinement direction) by forming vacant lattices spatially nonuniformly (in the confinement direction).

The proposed amendments clarify this point.

Claims 1, 5, 9, 12, 20, 24, 28 and 31 are rejected under 35 U.S.C. § 102(e) as being anticipated by Landwehr et al. (Office action paragraphs no. 5-9)

Reconsideration of this rejection is respectfully requested.

In the Response dated May 19, 2003, Applicants traversed the rejection, arguing on several grounds that strain generating a piezoelectric effect would not be inherent in Landwehr et al. The Examiner addresses these arguments in the Response to Arguments in paragraph no. 19 of the Office action. The Examiner states:

"It is Examiner's **contention that such effects will occur** in the Landwehr et al. structure. Note that Applicant's specification only describes relative values of the appropriate coefficient (see, for instance, page 2, line 25) and there is no showing that the effect is zero for other orientations." (emphasis added)

In traversing the rejection, Applicants respectfully note that the Examiner is making an inherency rejection, and in this regard MPEP 2112 states, in part:

"The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)(reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) ..."

U.S. Patent Application Serial No. **09/745,998**
Response dated February 11, 2004
Reply to OA of **December 22, 2003**

That is, the burden is on the Examiner to present a “basis in fact and/or technical reasoning” for the determination that strain generating a piezoelectric effect is inherent in Landwehr.

Applicants respectfully submit that the Examiner has not presented such a “basis in fact and/or technical reasoning.” On the other hand, the Applicants **have** presented considerable technical reasoning that the strain generating a piezoelectric effect would **not** be inherent in Landwehr, and the Examiner appears to have presented no argument contradicting Applicants’ reasoning.

In particular, Applicants note that the Examiner has stated: “Note that Applicant’s specification only describes relative values of the appropriate coefficient (see, for instance, page 2, line 25) and there is no showing that the effect is zero for other orientations”; however, the Applicant indicates the case where the piezoelectric effect is zero in the specification, page 89, from line 17. Since the embodiment of Landwehr et al. is a zincblende structure, the equation (2) in page 92, line 5 is applied. A semiconductor with zincblende structure is normally grown on a (001) plane, and it is thus reasonable to consider that the quantum well structure of the Landwehr et al. embodiment is formed on the (001) plane. Therefore, a relation $\alpha + \beta + 0$ is satisfied for the (001) plane, and a relation $\epsilon_{xy} = \epsilon_{xz} = \epsilon_y = 0$ is satisfied in the quantum well structure. Accordingly, substitution of these relations for the equation (2) in page 92, line 5 results in $P_z = 0$. Therefore, it can clearly be pointed out that the piezoelectric effect is zero in the normal plane direction for manufacturing the Landwehr et al. structure.

Applicants therefore submit that claims 1, 5, 9, 12, 20, 24, 28 and 31 are not anticipated by Landwehr et al.

U.S. Patent Application Serial No. **09/745,998**
Response dated February 11, 2004
Reply to OA of **December 22, 2003**

Claims 2 and 21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Landwehr et al. in view of Hashimoto. (Office action paragraphs no. 11-12)

Reconsideration of this rejection is respectfully requested.

Applicants have argued above that base claims 1 and 20 are not anticipated by Landwehr et al., and in particular that the reference does not disclose the “strain generating a piezoelectric effect” and that this is not inherent in the reference. Hashimoto also fails to clearly describe a principal-plane direction or strain, and does not describe a piezoelectric effect.

Applicants therefore submit that the combination of Landwehr et al. and Hashimoto lacks this limitation of the claims, and that a *prima facie* case of obviousness cannot be made for claims 2 and 21 using these references.

Claims 3, 4, 6, 7, 10, 11, 22, 23, 25, 26, 27, 29 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Landwehr et al. (Office action paragraphs no. 13-14)

Reconsideration of this rejection is respectfully requested.

Applicants have above that the base claims are not anticipated by Landwehr et al., and in particular that the reference does not disclose the “strain generating a piezoelectric effect” and that this is not inherent in the reference. Accordingly, a *prima facie* case of obviousness cannot be made for claims 3, 4, 6, 7, 10, 11, 22, 23, 25, 26, 27, 29 and 30 over this reference.

U.S. Patent Application Serial No. 09/745,998
Response dated February 11, 2004
Reply to OA of December 22, 2003

Claims 13-19 and 32-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over Landwehr et al. in view of Otsuka et al. (Office action paragraphs no. 15-17)

Reconsideration of this rejection is respectfully requested.

Applicants have argued above that base claims 1 and 20 are not anticipated by Landwehr et al., and in particular that the reference does not disclose the “strain generating a piezoelectric effect” and that this is not inherent in the reference. Applicants have also argued in the previous Response that Otsuka et al. describes strain quantum wells, but describes that a principal-plane direction of a substrate is (001) which is therefore not the principal-plane direction generating the piezoelectric effect.

Applicants therefore submit that no combination of these references provides the limitations of claims 13-19 and 32-38, and that claims 13-19 and 32-38 are novel and non-obvious over Landwehr et al. and Otsuka et al., taken separately or in combination.

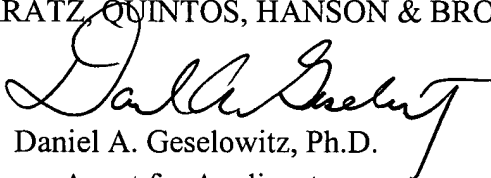
U.S. Patent Application Serial No. **09/745,998**
Response dated February 11, 2004
Reply to OA of **December 22, 2003**

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP



Daniel A. Geselowitz, Ph.D.

Agent for Applicants

Reg. No. 42,573

DAG/plb

Atty. Docket No. **001699**

Suite 1000

1725 K Street, N.W.

Washington, D.C. 20006

(202) 659-2930



23850

PATENT TRADEMARK OFFICE